

## PATENT SPECIFICATION

854,654

DRAWINGS ATTACHED.



Date of Application and filing Complete Specification :  
April 7, 1959. No. 11764/59.

Application made in United States of America on April 22, 1956.

Complete Specification Published : Nov. 23, 1960.

Index at Acceptance :—Classes 78(1), A3 ; 86, C19(A1 : CX) ; and 130, I(2 : 4 : 10).

International Classification :—A24b. B65g.

## COMPLETE SPECIFICATION.

**Improvements relating to Methods of and Apparatus for  
Processing Tobacco.**

We, P. LORILLARD COMPANY, a corporation organised and existing under the laws of the State of New Jersey, United States of America, having a place of business at 200 5 East 42nd Street, New York 17, New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement :—

This invention relates to processing tobacco and has particular reference to methods and apparatus for reclaiming fragmented tobacco 15 or tobacco fines, converting the same into equivalent tobacco shreds and blending the same with cut tobacco for manufacture into cigarettes or other smoking tobacco products.

It is well known that a considerable percentage of fragmented leaf tobacco or fines results from the normal processes of stemming, drying, casing, cutting and blending leaf tobacco to a form suitable for the manufacture of cigarettes and other tobacco products. These tobacco fines are high quality tobacco material and, if recoverable and convertible without substantial change into usable form, would improve many tobacco products as well as resulting in a considerable saving of valuable material which would otherwise be wasted or utilized as components of agricultural fertilizers and pesticides.

Many proposals have been advanced for the reconstitution of tobacco in various usable forms, but virtually all of them include a change in the characteristics of the tobacco, usually caused by the addition of a substantial percentage of gum adhesives needed to bind the finely-divided tobacco particles

in molded or sheet form in simulation of a stripped tobacco leaf for use as a cigar wrapper, for example, or cut into ribbons for blending with cigar or cigarette filler tobacco.

The present invention provides a process for reclaiming and converting tobacco fragments or fines resulting as a by-product from cigarette and cigar making processes substantially directly into tobacco shreds suitable for blending with tobacco, without the necessity of first forming the reclaimed tobacco into sheets and then cutting or slicing the same into properly-sized material for cigarette manufacture and the like.

According to the method of the invention, the waste tobacco product is ground ; the ground tobacco is mixed with a binder and the resulting mixture is compressed into filamentary shreds for admixture with cut natural tobacco. An apparatus for carrying the method of the invention into effect comprises a circumferentially grooved roller, a smooth-surfaced roller which is forced into tangential contact with the grooved roller, means for driving at least one of the rollers and means for feeding finely-divided tobacco between the rollers so as to be transversely compacted in the grooves of the grooved roller into elongated shreds.

In a preferred process of the invention, the tobacco fragments or fines which are collected as a by-product of the cigarette and cigar making processes are first screened to remove sand and other fine foreign particles, the resulting cleaned tobacco fines are ground or otherwise comminuted into particles of predetermined size, the ground material is again screened to reject undersize particles and oversize particles are recycled to the grinding stage. The ground tobacco

[Price 3s. 6d.]

Price 25p

of the proper size is then impregnated with an aqueous solution humectant, sugar, and a suitable binder. The impregnation is conducted under such conditions that the solution is dispersed through the interior of the tobacco particles so that the impregnated material does not feel moist, cannot be balled in the hand and resembles wood sawdust, although it may contain as high as 40% water.

The granular tobacco mixture is fed to the valley between two contacting driven rollers, one of which is smooth-surfaced and the other circumferentially slotted or grooved. The rollers are held in tangential engagement with sufficient pressure so that the tobacco is confined to and compressed within the grooves or slots and is thus compacted into discrete strings or shreds having lengths not less than about one inch and up to six inches or longer. The shreds so formed are then dried to remove moisture down to about 20% by weight and admixed with cut tobacco from the natural stripped leaf in a proportion on the order of 1 to 20% by weight for manufacture into cigarettes or other smoking tobacco products in the usual way.

It will be seen that the process and apparatus of this invention provide an efficient and economical way of reclaiming high quality by-product tobacco fines and utilizing them to improve the finished smoking article such as a cigarette.

A more complete understanding of the invention may be had by reference to the accompanying drawings, in which:

Figure 1 is a flow diagram illustrating the tobacco reclaiming process and apparatus of this invention;

Figure 2 is a plan view of the tobacco compacting and shred-forming mechanism of this invention;

Figure 3 is an end elevation thereof as seen along the line 3—3 of Figure 2; and

Figure 4 is an enlarged fragmentary section through the grooved or slotted roller as seen along the line 4—4 of Figure 3.

Referring to the flow diagram of Figure 1, numeral 10 designates one of the boxes in which the tobacco fines such as dust, stems, conveyor siftings and the like are collected as by-products from the cigar, cigarette and other tobacco product manufacturing processes. Before being loaded into the boxes 10, the fines are passed over an 80 mesh per inch screen to remove sand and other heavy fine foreign particles. The boxes 10 are mounted on dollies or fitted with casters, wheels or rollers and conveyed to and emptied into a receiving hopper 11. The suction pipe 12 of a pneumatic conveyor 13 driven by a fan 14 carries the tobacco fines to one or more storage bins 15. Preferably, there are a number of such bins 15, each receiving and storing a different type of

material. Thus one bin 15 may receive only by-product tobacco fines from a hopper 11 supplied by a box 10 from the stemmery, another bin 15 may receive only shorts, another conveyor siftings, and so on.

The bottom of each bin 15 is provided with an individual rotary motor-driven proportioning feeder 16, which deposits a predetermined amount from each bin 15 on a belt-type conveyor 17. By preselecting the feeders 16 and their rate of discharge, the proper blends of materials from the several bins 16 may be provided.

The conveyor 17 discharges into a hopper 18 having a float switch 19 which actuates a switch shutting off the driving motor 20 of the conveyor 17 when the hopper is filled and restarts the motor 20 when the level of the material in the hopper 18 drops below a predetermined point. In a manner readily understood the float switch 19 may similarly control the driving motor of any feeder 16 that is in operation at the time the hopper 18 is filled or empty in order to preclude excessive accumulation of material on the conveyor 17 when it is stationary.

The hopper 18 is provided with a motor-driven proportioning feeder 21 similar to feeders 16 for delivering the material to a belt flow-scale 22 of known construction and adjusted to control the speed of feeder 21 so that a predetermined weight of material per minute is fed by flow-scale 22 to the multi-stage motor-driven grinder 23.

Grinder 23 may be a hammer mill, ball mill, or impact mill, and mixes and grinds the tobacco material to a size such that it passes through a screen of 60 mesh per inch with about 80% smaller than 100 mesh, so that the ground material discharged from the mill 23 is finely-divided but not powdered. This finely-divided material is drawn from the last stage of the mill or grinder 23 to storage bin 24 by the suction pipe 25 of a pneumatic conveyor 26 driven by fan 27.

As it is required, the finely-divided tobacco material is fed to flow-scale belt 29 by a motor-driven proportioning feeder 28 similar to the feeder and flow-scale combination 21, 22 previously described. This measured material is fed by belt 29 to the hopper of motor-driven mixer 30 where it is mixed with an aqueous solution or mixture of binder and humectant supplied from tank 31 by pipe 32 at a predetermined rate controlled by valve 33.

Several forms of aqueous binder and humectant mixtures or solutions may be provided in tank 31. For example, the binder may be a mixture of 85 parts of sodium salt of carboxymethyl cellulose (CMC), 7.5 parts of the sodium salt of carboxymethyl-hydroxyethyl cellulose (CMHEC), 7.5 parts of guar gum. The CMC, CMHEC and guar gum are added together in a dry form and mixed

thoroughly in a twin-shell blender. The binder mixture is added to the sugar-humectant solution which has been heated to 85° C. The sugar-humectant solution consists of 6.45 parts of Nulomoline (Registered Trade Mark) (inverted sugar solution), 3.85 parts of glycerine, 0.65 parts of propylene glycol, 0.01 part of methyl-p-hydroxybenzoate (MPHB), and 89.04 parts of water. Six pounds of dry binder are added to 154.0 pounds of sugar-humectant solution. This binder-sugar-humectant solution has a viscosity of about 36,000 centipoises at 69° C.

Another suitable aqueous binder and humectant solution comprises 50 parts of corn starch and 10 parts of the above sugar-humectant solution mixed with 200 parts of water. The resulting binder-sugar-humectant solution has a viscosity of about 36,000 centipoises at 69° C.

About 160 pounds of either binder-sugar-humectant solution from tank 31 are fed to mixer 30 together with 190 pounds of the powdered tobacco material and 10 pounds of cellulose fibres, which are added to flow-scale 29 with the tobacco from feeder 28. The cellulose fibres may be alpha-cellulose flock, shredded cigarette papers, or other substantially ash-free natural or synthetic cellulose fibres which are odorless and non-toxic when burned.

The resulting mixture consists of tobacco particles surface-coated with the binder-sugar-humectant solution but not materially impregnated therewith. Thus, the tobacco material is damp with the solution but it is not wet or doughy, but is more dry than wet so as to be readily fluent or flowable. This mixture is discharged from mixer 30 through pipe 34 leading to dispersing machine 35, which contains a motor-driven beater-screw or propeller 36, and may be a pressure muller, vacuum impregnator, pug mill, extrusion apparatus, or a high speed centrifugal mixer. The machine 35 accordingly impregnates or introduces the surface-carried binder-sugar-humectant solution into the interior of the tobacco particles which initially had a moisture content of about 8 to about 15%. In some instances the dispersing machine 35 will make premixing in mixer 30 unnecessary.

The resulting tobacco material discharged by machine 35 to suction pipe 37 is a homogeneous flowable mixture of solid tobacco and binder-sugar-humectant solution containing about 30 to about 40% water, but it does not feel moist to the touch, cannot be balled in the hand and somewhat resembles slightly damp wood sawdust.

The suction pipe 37 of the pneumatic conveyor 38 driven by fan 39 conducts the dispersed fluent tobacco material to a storage bin 40 from which it is metered by motor-driven proportionate feeder 41, similar to feeder 16, to the suction pipe 42 of a pneu-

matic conveyor system driven by fan 43 for supplying storage containers 44. Storage containers 44 are shown schematically in Figure 1 as comprising a series of closed chambers 45, nine being shown, but there may be more or less depending upon requirements. Each chamber 45 includes a bin or hopper provided with a float switch and is normally closed by a valve 46 and is filled with the fluent material from the storage bin 40. Only the bin 50 with float switch 52 and connecting pipe 51 of the lowest chamber 45 in Figure 1 are shown in this figure for the sake of clearness.

When one of the bins is empty or partially empty, the corresponding valve 46 is opened, and with the valve 47 in eduction pipe 48 closed, the contents of the chamber 45 corresponding to the opened valve 46 are discharged into the associated storage bin 50 through pipe 51, owing to the suction exerted by the fan 43. This may be done manually, but preferably it is done automatically by means of the float switch 52 in bin 50, which responds to drop in the level of material in bin 50 to open the valve 46 electrically and reclose it when the level in bin 50 rises to a predetermined height, so that the flow of material into the corresponding bin will stop.

When all valves 46 are closed and the corresponding chambers 45 filled, valve 47 is opened automatically and the dispersed material from storage bin 40 is returned thereto via pipes 42 and 48. When the pressure at the feeder 41 exceeds atmospheric, weighted valve 53, normally closing discharge pipe 54 from fan 43, opens and vents excess air and any entrained material to the dust house, not shown, and to which the exhaust of fans 14, 27 and 39 also are connected.

A regulated flow of impregnated tobacco material is supplied from storage bins 50 by a motor-driven proportionate feeder 55, similar to 16, to a belt type flow-scale 56, similar to flow-scale 22, and whose flow rate is so adjusted to hopper 57 that the valley between rollers 58 and 59 is maintained level filled.

Referring now to Figures 2, 3 and 4, showing the rollers 58 and 59 in enlarged scale with their accompanying mechanism, it will be seen that roller 58 is journaled in fixed bearings 60 mounted on a suitable base plate 120 casting 61 and that roller 59 is journaled in arms 62 pivoted at 63 on base casting 61. Pivoted arms 62 and consequently roller 59 are urged toward roller 58 by strong coiled tension springs 64 so that roller 59 engages roller 58 with considerable pressure for a purpose to be described. Alternative pressure means, such as hydraulic cylinder and piston combinations or compression springs and the like may be employed to urge rollers 120

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58 and 59 together instead of the tension springs 64.

As is shown particularly in Figure 2, roller 58 is grooved or slotted circumferentially and preferably is of larger diameter than roller 59, which is smooth surfaced. The surfaces of rollers 58 and 59 preferably are made of surface-hardened steel and are accurately machined so that the ridges, ribs or lands 65 that are formed between the circumferential slots or grooves 66 engage the smooth surface of smaller roller 59 at the line of tangential contact between them so as to confine the tobacco material fed between the rollers from hopper 57 to the grooves or slots 66 without permitting any of it to enter between the lands 65 and the contacting surface of smooth roller 59. This confining and limiting action is not only provided by the sharply-defined lands 65 but also by the considerable pressure with which the rollers 58 and 59 are forced together by the springs 64, with the result that the tobacco material is laterally or transversely compacted in the slots or grooves 66 as distinguished from the axial or longitudinal compaction effected by an extrusion process. The tobacco material is accordingly formed with the aid of the sugar-binder-humectant content thereof, into elongated strings or shreds 67 which are sufficiently strong to be self-sustaining to a substantial degree, such that they break off into lengths not less than about one inch and up to about six inches or longer as they fall by gravity from between the rollers 58, 59, as is shown in Figure 3.

The cross-sectional dimension or diameter of the shreds 67 is largely determined by the use to which they are to be put. If they are to be blended with cut tobacco for cigarette manufacture, they are of substantially corresponding dimensions. Thus, it has been found that an axial width of about .033 inch and a radial depth of about .006 to .020 inch is satisfactory depending on the end use. A generally rectangular cross-section for the groove or slot 66 has been found to be satisfactory, although for uses such as for smoking tobacco or cigar filler blending, larger dimensions and a different shape of slot or groove cross-section, such as V-shaped or semi-circular, for example, may be required.

The width of the ribs, ridges or lands 65 should be as narrow as possible for optimum output of the machine, but because of the considerable pressure with which the rollers 58 and 59 are held together, they must be sufficiently wide to preclude grooving the smooth roller 59 and strong to withstand being distorted. Thus, a land width of about .017 inch has been found to be a satisfactory minimum dimension for manufacture of cigarette blending shreds, although that dimension may be increased as desired and where lower pressures are used, may be

decreased slightly. With these dimensions, the proper pressure should be such that the rollers cut thin paper, e.g., cigarette paper, to shreds.

As shown in Figures 2 and 3, the grooved roller 58 is fitted with a spur gear 68 driven by spur gear 69 from a suitable source of power like an electric motor, not shown. Smooth roller 59 is not driven except by friction from grooved roller 58, so that both rollers 58 and 59 rotate at the same peripheral speed, without erosive slippage between them.

The shreds 67 are stripped from the slots or grooves 66 by the spring fingers of a comb-shaped stripper 70, the tips of these fingers projecting into the slots or grooves in the manner shown in Figure 3. The stripper 70 is mounted on base plate 61 and the pressure of its fingers on the bottoms of the corresponding slots or grooves 66 may be adjusted by screw 71. A spring scraper 72 mounted on base plate 61 engages the surface of smooth roller 59 to clean off any surplus material which may have adhered thereto. This surplus material may be discharged to a receptacle, not shown, for return to storage bin 24, for example.

The formed shreds 67 of reclaimed tobacco fines are deposited by the forming rollers 58, 59 on a conveyor belt 73 preferably made of stainless steel, and driven at the same surface speed as the rollers 58, 59 by suitable means, not shown. The shreds are passed by belt 73 through a drying chamber 74 where it is heated from below by suitable heating means, such as gas burners, and from above by radiant heaters or combinations thereof. In the drying chamber 74, the shreds are dried to about 20% by weight moisture content.

The shreds are discharged by belt 73 to the chute 75 of a vibrating or shaking type separator 76 where any agglomerated or "Siamese" shreds are removed and returned by pneumatic conveyor system 77, 78, 79 to the input pipe 34 of the dispersion machine for reprocessing. Those shreds which are not oversize are passed by screen 76 to vibrating screen 80 which passes the fines to suction pipe 81 for return to raw material storage bin 24.

The proper sized shreds 67 of tobacco fines reclaimed according to this invention are discharged from separator screen 80 to chute 82 which deposits them on driven conveyor 83 for blending with cut leaf tobacco on conveyor 84 receiving the same from rotary kiln drier 85. The proportion of reclaimed shreds from belt 83 is 2 to 10% by weight to 98 to 96% by weight of cut tobacco on belt 84 which accordingly deposits the same in this proportion into a rotary kiln type of cooler 86 which cools and blends the reclaimed tobacco shreds and cut tobacco leaf for use in manufacture of cigarettes or other tobacco

products in cigarette-making machine 88 to which it is carried from cooler 86 by conveyor 87, which may, instead, carry the blend to storage for use when required.

- 5 The process and apparatus of this invention will be readily understood from the foregoing description of the schematic flow diagram of Figure 1 and the shred making machine illustrated by Figures 2, 3 and 4, 10 and the process may be further exemplified by the following tabulation of ingredients and proportions of a typical composition of the reclaimed tobacco material supplied to the shred-forming rolls 58 and 59:

15	Tobacco powder and cellulose fibres.	Lb.	
	Cigarette dust	50.0%	100
	Slivers	38.0%	76
20	Bright (particles passing a No. 8 screen)	5.0%	10

Burley (particles passing a No. 8 screen)		2.0%	4
Cellulose fibres	..	5.0%	10
		100.0%	200

"Bright" is a tobacco grown in the Kentucky area of the United States.

"Burley" is a tobacco grown in the Virginia area of the United States.

#### Binder.

Material	Lb.	% Total Binder	% Added to Tobacco	30
CMC	5.10	85.0	2.550	
CMHEC	.45	7.5	0.225	
Guar Gum	.45	7.5	0.225	
Total	6.00	100.0	3.000	35

#### Sugar Humectant Solution

Material	Lbs.	% Total Liquid	% Added to Tobacco
Nulomoline	0.93	6.45	4.97
Glycerine	5.93	3.85	2.97
Propylene glycol	1.00	0.65	0.50
Methyl p-hydroxybenzoate	0.02	0.01	0.01
Water	137.12	89.04	68.56
Total	154.00	100.00	77.01

- 45 It will be understood that the formulations, methods and apparatus herein described are illustrative examples of the invention.

We are aware of the Customs and Excise Act, 1952 (15 and 16 Geo. 6 and 1 Eliz. 2, Ch. 44) and we make no claim to use the invention in contravention of any of the provisions of that Act.

#### WHAT WE CLAIM IS:

1. A method of reclaiming tobacco resulting as a waste by-product of the manufacture of smoking tobacco products, which comprises grinding the tobacco, mixing the ground tobacco with a binder and compressing the resulting mixture into filamentary shreds for admixture with cut natural leaf tobacco.
2. A method according to Claim 1, in which the ground tobacco and binder is compressed into shreds by being laterally compacted.
3. A method according to Claim 1 or Claim 2, in which the filamentary shreds have the approximate dimensions of cut leaf tobacco.
4. A method according to any one of the preceding claims, which also comprises ad-

mixing the filamentary shreds with cut natural leaf tobacco.

5. A method according to any one of the preceding claims, in which the natural moisture content of the ground tobacco is increased to between about 30 to 40% by weight before being compressed.

6. A method according to any one of the preceding Claims 1 to 5, in which the binder is an aqueous solution.

7. A method according to any one of the preceding claims, in which the ground tobacco is impregnated with an aqueous sugar solution.

8. A method according to any one of the preceding Claims 1 to 5, in which the ground tobacco is impregnated with an aqueous humectant solution before being compressed.

9. A method according to any one of the Claims 1 to 5, in which the ground tobacco is impregnated with an aqueous sugar and binder solution before being compressed.

10. A method according to any one of the preceding Claims 1 to 5, in which the ground tobacco is impregnated with an aqueous sugar and humectant solution before being compressed.

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11. A method according to any one of the preceding Claims 1 to 5, in which the ground tobacco is impregnated with an aqueous sugar and binder-and humectant solution before being compressed. 25
12. An apparatus for reclaiming tobacco fines when used for carrying out the method claimed in Claim 1, comprising a circumferentially grooved roller, a smooth-surfaced roller, means for forcing said rollers into tangential contact, means for driving one of said rollers, and means for feeding finely-divided tobacco between said rollers so as to be transversely compacted in the grooves of the circumferentially grooved roller into elongated shreds. 30
13. An apparatus according to Claim 12, comprising also a grinder for comminuting the tobacco fines into substantially uniform sized particles. 35
14. An apparatus according to Claim 12 or Claim 13, in which the rollers are disposed in parallel relation to one another and are forced by resilient means into tangential contact. 40
15. An apparatus according to Claim 13 or Claim 14, comprising also a receptacle for an aqueous binder, sugar or humectant liquid or a mixture of two or more of such liquids, a mixing apparatus, means for feeding the comminuted tobacco from the grinder and liquid from said receptacle to said apparatus.
16. A method of reclaiming tobacco resulting as a waste by-product of the manufacture of smoking tobacco products substantially as described.
17. Apparatus for reforming tobacco fines into usable tobacco products substantially as described with reference to the accompanying drawings.

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Abingdon: Printed for Her Majesty's Stationery Office, by Bargees & Son (Abingdon), Ltd.—1960.  
Published at The Patent Office, 35, Southampton Buildings, London, W.C.2,  
from which copies may be obtained.

FIG. I.

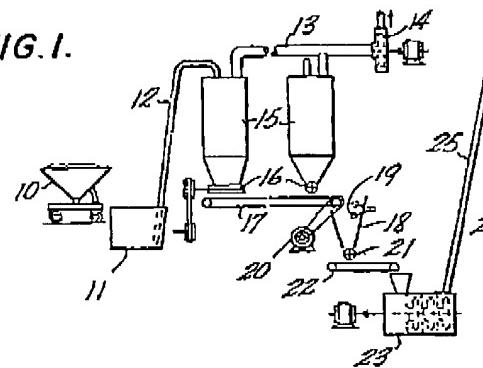


FIG. 4.

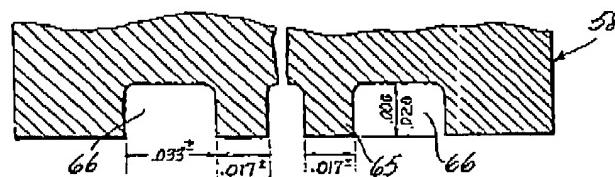
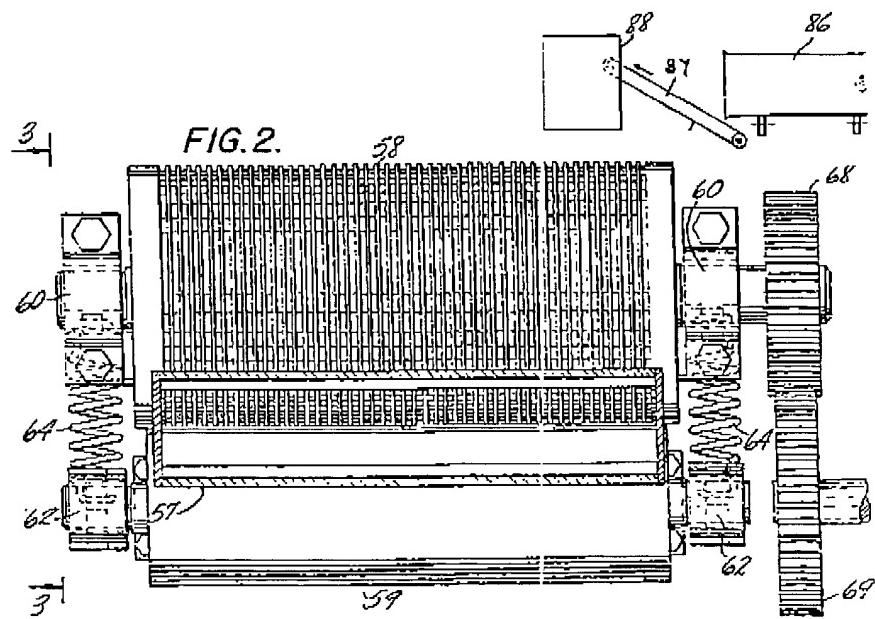
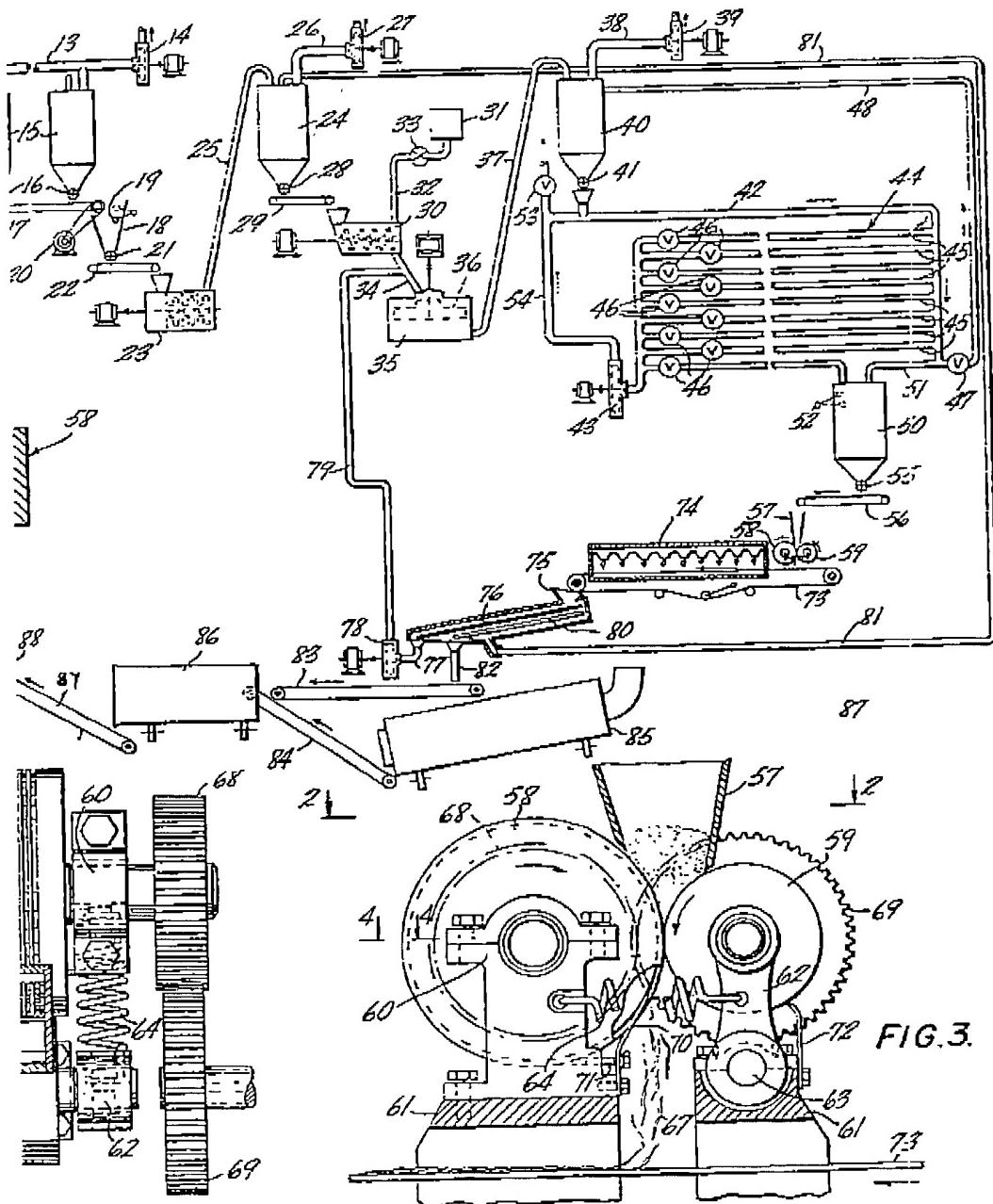


FIG. 2.



## 854,654 COMPLETE SPECIFICATION

1 SHEET

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the Original on a reduced scale.*

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